Systems Engineering Enablers to Help Your Project Succeed

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Purpose

- A wealth of resources exist which provide immediate access to excellent Systems Engineering enablers.
- We plan to look at many of those resources and illustrate how you can effectively get access to the Systems Engineering enablers you need.

What is Systems Engineering?

Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem:

Operations

Performance

Test

Manufacturing

Cost & Schedule

Training & Support

Disposal

What is Systems Engineering? (continued)

- Systems Engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. Systems Engineering considers both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs.

Why is Systems Engineering a Hot Topic?

Research conducted by the Standish Group* shows a staggering 31.1% of engineering development projects will be canceled before they ever get completed. Further results indicate 52.7% of projects will cost 189% of their original estimates. The cost of these failures and overruns are just the tip of the proverbial iceberg.

*The Standish Group is based in West Yarmouth, Massachusetts and is an Information Technology leader in project and value performance. www.standishgroup.com

What kinds of Systems Engineering Challenges are you experiencing right now?

Challenges

- Quagmire of standards and methodologies
- Processes vague
- No clear roadmap to follow.
- Required SE Competencies unclear
- Some feel overwhelmed at the outset

The Good News!

- Some excellent enablers are available to you RIGHT NOW
- Today, we will look at a number of these enablers AND look at ways you can quickly identify specific enablers that your project can really use.

Before we begin …

- NASA has a Unique Role -- Enablers for the global Systems Engineering community may not be the “needed enablers” for a specific NASA project,
- However, many Systems Engineering enablers originating outside of the NASA domain have been successfully applied to NASA projects.

Where to Look?

- NASA
- Dept of Defense
- Other Government Agencies
- Industry supported and non-profit Professional Organizations
- Academia

Enablers

- Enable: To supply with the means, knowledge, or opportunity
- Means .. Money / Business case / Tools
- Knowledge … Methodology / Expertise
- Opportunity … Online resources available to you TODAY

Kinds of Enablers

- Processes
- Process Improvement / Assessments
- Product Guides
- Communities of Practice

Processes

- Space and Naval Warfare Systems Center (SSC) San Diego Process Asset Library: A repository of enterprise level standard process assets with emphasis on Systems Engineering. http://sepo.spawar.navy.mil/

- University of Arizona: Extensive classroom presentation materials on Systems Engineering Methodology http://www.sie.arizona.edu/sysengr/

Processes (continued)

- Department of Energy (DOE) Systems Engineering Methodology (SEM): Integrates systems engineering, software engineering, project management, and quality assurance processes into a lifecycle that is controllable, predictable, and repeatable. Tailored to fit the needs of various types and sizes of projects. http://cio.doe.gov/ITReform/sqse/

Assessments / Process Improvement

- Software Engineering Institute (SEI) : Provides a wide array of white papers and resources on CCMI related activities and process improvement) www.sei.cmu.edu

- Systems and Software Consortium : Focuses on realizing Return-On-Investment (ROI) from Process Improvement Initiatives – extensive literature on establishing meaningful metrics www.systemsandsoftware.org

Product Guides

- Defense Acquisition University / Department of Defense Architecture Framework: Eloquent, but massive, on-line “integrated framework chart” that ties systems engineering in with system architecture definition. Interactive chart allows “drill down” to individual activities with knowledge management flavor http://akss.dau.mil/ifc/

Product Guides (continued)

- Department of Defense Design and Analysis Center for Software (DACS):

  Easy to use access to 32 Systems Engineering and Systems Acquisition best practices which have been proven to yield high Return-on-Investment. www.goldpractices.com

Communities of Practice

- International Council on Systems Engineering (INCOSE):

  INCOSE has over thirty technical teams focused in areas such as requirements and risk, education and research, modeling and tools, and the application of systems engineering to specific domains. www.incose.org

Communities of Practice (cont.)

- Defense Acquisition University (DAU) Acquisition Community Connection: Web Enabled Communities of Practice with access to thousands of Practitioners http://akss.dau.mil/

  (Knowledge Sharing / Acquisition Community Connection)
- DoD Design and Analysis Center for Software (DACS): Access to Case Studies that address both enablers and roadblocks encountered for 32 key systems engineering focus areas www.goldpractices.com

Communities of Practice (cont.)

- The Department of Defense (DoD) Best Practices Clearinghouse:

  Planned to be a Single Source for answers about practices, how to apply them, when they are good to use; lessons learned; and risks to avoid – due to be unveiled in late 2006.

The DoD Acquisition Best Practices Clearinghouse

Useful Information

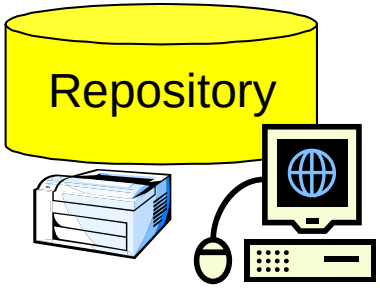
Help finding, selecting, and implementing practices appropriate to your situation; fill the gap between "what" and "how"

A Single Source

For answers about practices, how to apply them, when they are good to use; lessons learned; and risks to avoid

Active Knowledge Base

Not just another practice list; experience data updated, expanded refined; encourages organic growth



Living Knowledge

Access to experts and communities of practice

Validated practices

Consistent, verifiable information

Challenges when selecting the "right" enablers

- Too many lists to choose from
- No basis for selecting specific practices
- Proof of effectiveness is not generally available
- Not easy to see connection between practices and specific program risks or issues
- Practice's success factors not well understood
- Resources are limited and the return on practice investment is unknown (costs/benefits)
- Implementation guidance is inadequate

Tips on Selecting the “right” enablers.

- Avoid the urge to “graze”
- Use existing literature surveys to do your leg work for you. (Crosstalk, The Journal of Defense Software Engineering, is a respected source for these kinds of surveys.) www.stsc.hill.af.mil/**crosstalk/**

Tips on Selecting the “right” enablers (continued)

- Validate candidate enablers with independent feedback
- Engage sources directly
- Think of alternative enablers as a completeness check
- Look in your own backyard FIRST!

NASA Agency Level Enablers

- Systems Engineering Process Guides
  - SP-6105 “NASA Systems Engineering Handbook”
  - NPR-7123 “NASA Systems Engineering Processes and Requirements”
- Systems Engineering Assessments
  - Systems Engineering CMMI Pre- Assessment

NASA Agency Level Enablers (continued)

- Systems Engineering Product Guides
  - Agency Product Guides in work (such as Polaris)
- Systems Engineering Community of Practice
  - NASA Systems Engineering Working Group

NASA Center-Level Enablers (JSC)

- Systems Engineering Assessment Results
  - JSC Systems Engineering Benchmarking Study
- Systems Engineering Process Guides
  - JPR 7120.3 “Project Management: Systems Engineering & Project Control Processes and Requirements”

NASA Center-Level Enablers – JSC (continued)

- Systems Engineering Process Improvement
  - Guidelines for Systems Engineering Continuous Improvement
- Systems Engineering Product Guide
  - Compendium of Systems Engineering product guidelines based on JPR 7120.3

NASA Center-Level Enablers – JSC (continued)

- Systems Engineering Community of Practice
  - JSC Systems Engineering Working Groups

Summary

- Excellent Systems Engineering Enablers exist both within NASA and outside of NASA.
- There are straightforward guidelines to use when considering which enablers are best for your project.
- Leveraging off of the work already done by others can be a smart move as you use Systems Engineering Enablers to help your project succeed!